

### Claims

1. Method for testing the error ratio of a device under test against a specified allowable error ratio with the following steps:
  - measuring  $n_s$  samples of the output of the device, thereby detecting  $n_e$  erroneous samples of these  $n_s$  samples,
  - defining  $BER(n_e) = n_e/n_s$  as the preliminary error ratio and
  - deciding to pass the device, if the preliminary error ratio  $BER(n_e)$  is smaller than an early pass limit  $EPL(n_e)$ , **characterized in that**
    - the early pass limit is constructed by using an empirically or analytically derived distribution for a specific number of devices each having exactly the specified allowable error ratio by separating a specific portion  $DD$  of the best devices from the distribution for a specific number of erroneous samples  $n_e$  and proceeding further with the remaining part of the distribution for an incremented number of erroneous samples.
2. Method for testing the error ratio according to claim 1, **characterized in that**
  - the first point of the early pass limit is constructed by using an empirically derived distribution with the following steps:
    - simulating the error behaviour of a high number of devices each having the specified allowable error ratio,
    - noting in a first column of a table the number  $n_1$  of samples until the first error occurs for each individual device,
    - calculating the preliminary error ratio  $BER (n_e=1)$  of the first error by  $BER(n_e=1) = 1/n_1$ ,
    - separating the best  $DD$  devices and identifying a separation point, which marks the preliminary error ratio

BER(ne=1) of the worst of the DD best devices, as the first point EPL(ne=1) of the early pass limit.

3. Method for testing the error ratio according to claim 2,

**characterized in that**

the next point of the early pass limit is constructed by the following steps:

- simulating the error behaviour of the remaining devices,
- noting in the next column of the table the number  $n_i$  of samples until the next error occurs for each individual device,
- calculating the preliminary error ratio BER(ne) of the next error by  $BER(ne) = ne / \sum_i n_i$ ,
- separating the best DD devices and identifying a separation point, which marks the preliminary error ratio BER(ne) of the worst of the DD best devices, as the next point EPL(ne) of the early pass limit and
- repeating the above steps.

4. Method for testing the error ratio according to claim 2 or 3,

**characterized in that**

the simulating the error behaviour is done with a random generator or a pseudo random generator.

5. Method for testing the error ratio according to claim 1,

**characterized in that**

the first point of the early pass limit is constructed by using an analytically derived distribution with the following steps:

- defining a first preliminary distribution

$$P_1(ns) = BER \cdot (1-BER)^{ns-1}$$

with

BER is the true error ratio of the device and

$P_1$  is the probability to find the first error  $ne = 1$  after ns samples,

- separating the DD best part from the 1-DD worst part of the distribution  $P_1$  and identifying the separation point of the DD best part from the 1-DD worst part as the first point EPL(ne=1) of the early pass limit and
  - 5 - defining the 1-DD worst part of the first preliminary distribution  $P_1$  as a first distribution  $U_1$  of undecided devices.
6. Method for testing the error ratio according to claim 5,
- 10 **characterized in that**
- the next point of the early pass limit is constructed by the following steps:
- defining a next preliminary distribution
  - 15  $T_2(ns) = U_1(ns) * P_1(ns)$   
with  
 $T_2(ns)$  is the probability to find the next error after ns samples regarding the loss of the best DUTs from the previous step and
  - 20  $*$  is the convolution operation
  - separating the DD best part from the 1-DD worst part of the distribution  $T_2$  and identifying the separation point of the DD best part from the 1-DD worst part as the next point EPL (ne) of the early pass limit,
  - 25 - defining the 1-DD worst part of the distribution  $T_2$  as the next distribution  $U_2$  of undecided devices and
  - repeating the above steps.
7. Method for testing the error ratio according to any of
- 30 claims 1 to 6,
- characterized in that**
- the specific portion DD of the best devices is selected with regard of the desired selectivity of the test.
- 35 8. Method for testing the error ratio according to claim 7,
- characterized in that**
- the selectivity of the test is defined as

(pass probability - (the complement of the pass probability, which is the fail probability)) / ,  
(error ratio of a bad device - specified allowable error ratio).